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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

KHARE, ATUL P

ART UNIT

PAPER NUMBER

1791

NOTIFICATION DATE

DELIVERY MODE

03/31/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

OfficeAction25944@oliff.com  
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<b>Office Action Summary</b>	<b>Application No.</b> 10/582,990	<b>Applicant(s)</b> SATO ET AL.	
	<b>Examiner</b> ATUL KHARE	<b>Art Unit</b> 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 December 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 1-10 and 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-20 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: _____                          |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :02/06/2008, 06/04/2007, 03/15/2007, 09/22/2006.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Group II, claims 11-20 in the reply filed on 24 December 2009 is acknowledged. The traversal is on the ground(s) that all claims are sufficiently related that a thorough search for the subject matter of any one group of claims would encompass a search for the subject matter of the related claims without serious burden. This is not found persuasive because: Restriction for examination purposes as indicated is proper because all these inventions listed in this action lack unity and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- (a) the inventions have acquired a separate status in the art in view of their different classification;
- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;
- (c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- (d) the prior art applicable to one invention would not likely be applicable to another invention;
- (e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

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The requirement is still deemed proper and is therefore made FINAL.

2. Claims 1-10 and 21 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 24 December 2009.

### ***Claim Objections***

3. Claim 18 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 18 requires controlling the direction of the fibers in a two-dimensional manner, but claim 11, from which claim 18 depends, requires alignment of the fibers. The alignment required by claim 11 implicitly requires some form of two-dimensional alignment.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 11-20 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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6. Claim 11 recites the limitation "the pressure" in lines 8-9 of the claim. In a first interpretation, "the pressure" could refer to the gas atmosphere in which the jig is placed, but this would contradict the use of upper and lower punches as recited in the specification (Fig. 1, items 3 and 4). In a second interpretation where "the pressure" refers to another means for applying pressure (such as upper and lower punches), there is insufficient antecedent basis for this limitation in the claim. For examination, "the pressure" will be interpreted as "a pressure" applied separately from the air, vacuum, or inert gas atmosphere.

7. As to claims 14 and 19, the phrase "a ball mill or the like" renders the claim unclear because "or the like" does not require any specific mixing method. For purposes of examination, "or the like" will be interpreted to require any conventional mixing method.

8. As to claim 18, the "direction of carbon fiber is controlled in a two-dimensional manner" appears to contradict the "fiber mixture is aligned" recited in claim 11 since the alignment of claim 11 suggests alignment in one direction.

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 11-14, and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hager et al. (US 6,013,371) in view of Gadow et al. (US 2002/0142146) and Kawai (US 5,993,733).

13. As to claims 11, 12, 17, and 18 Hager teaches in a process for the manufacture of carbon artifacts and compositions: creating a dryblend of pitch powders with various fractions of vapor-grown or other carbon fibers, pressing or injecting the mixture into a mold, and sintering the mixture (column 2 lines 24-46). The sinterable mixture may be

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uniformly blended with vapor-grown carbon fibers, other carbon fibers (such as a pitch- or PAN-based carbon fibers (abstract, Table A)), and metal powders (column 9 lines 29-32). The materials are blended using, in some examples, a tumbler or ball mill (column 10 lines 12-15). Sintering is performed in an inert atmosphere (column 9 lines 21-23). Pressure may be applied during the sintering process to improve sinterability of the mixture (column 6 lines 45-52, column 14 lines 56-58).

Hager does not appear to explicitly disclose aligning the mixture or supplying pulse electric current to cause sintering. However, Gadow teaches in a method for making a fiber-reinforced composite ceramic: aligning carbon fibers in the main stress direction of a brake disc [0039]. This alignment constitutes two-dimensional alignment as required by claim 18. Additionally, Kawai teaches in a method of manufacturing a sintered product: forming a mixture of metal sinterable powders and carbon fibers (column 3 lines 44-47), and sintering the mixture by applying pressure while simultaneously supplying a pulse current through the compacted materials (column 2 lines 32-40, column 2 line 66 to column 3 line 2). Sintering is performed under vacuum (column 5 lines 11-15). It would have been obvious to apply the fiber alignment step taught by Gadow as an improvement to the Hager method to counteract the main stresses in the final product. It would have been obvious to substitute the pulse electric current sintering method of Kawai with the sintering method of Hager as a conventional alternative or substitute sintering process for affecting sintering in a fiber-reinforced composite structure. Alternatively, one would have been motivated to incorporate the



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pulse electric current sintering method of Kawai with the sintering method of Hager in order to reduce the sintering time and achieve a higher density material.

14. As to claim 13, Hager does not appear to explicitly disclose that the metal powder is selected from the group consisting of copper, aluminum, magnesium, and their alloys. However, Kawai teaches in a method of manufacturing a sintered product: forming a mixture of metal sinterable powders and carbon fibers, wherein the metal sinterable powder can be a powder of a copper base alloy containing aluminum (column 3 lines 38-47). It would have been obvious to substitute the metal powder materials of Kawai with those of modified Hager as a conventional material used in fiber-reinforced composite structures.

15. As to claims 14 and 19, Hager teaches using a tumbler or ball mill to mix the carbon fiber and metal powder as described in the rejection of claim 11 above. The final product contains discontinuous fiber reinforcement (column 3 lines 62-65). The carbon fibers are typically 0.1 to 0.2 microns in diameter with a length to diameter ratio in the hundreds to thousands (column 9 lines 62-63), making the length of the fibers between at least 10-200 microns. In the alternative that Hager does not teach the required fiber length, Gadow teaches in a method for making a fiber-reinforced composite ceramic: using fibers with a length between 2-10 mm [0021]. It would have been obvious to substitute the fiber dimensions of Gadow with those of modified Hager as a conventional fiber length used in fiber-reinforced composite structures.

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16. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hager et al. (US 6,013,371) in view of Gadow et al. (US 2002/0142146) and Kawai (US 5,993,733) as applied to claims 11-14 and 17-19 above, and further evidenced by Yonetake (US 2006/0286361). As to claim 15, Hager teaches using a tumbler or ball mill to mix the carbon fiber and metal powder as described in the rejection of claim 11 above. Hager does not appear to explicitly disclose having a fiber length of 5 mm or more, or maintaining fiber direction during mixing. However, Gadow teaches in a method for making a fiber-reinforced composite ceramic: using fibers with a length between 2-10 mm [0021]. It would have been obvious to substitute the fiber dimensions of Gadow with those of modified Hager as a conventional fiber length used in fiber-reinforced composite structures. Additionally, Yonetake teaches in a method for making a resin composite material: the step of pulverizing a carbon fiber mixture in a ball mill helps to create orientation (or alignment) of the carbon fibers [0066]. An unpulverized carbon fiber mixture is depicted at figure 2 to have no alignment, and a pulverized carbon fiber mixture is depicted at figure 3 to have relative alignment in one particular direction. The teaching of Yonetake can be applied to the modified Hager method to demonstrate that fiber alignment is created and maintained during the ball milling mixing step.

17. Claims 11-13, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bieler et al. (US 5,891,249) in view of Kawai (US 5,993,733). As to claims 11-13, 18, and 20, Bieler teaches in a method for preparing metal matrix fiber

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composites: introducing a tow of fibers into a chamber in which particles of a metal containing powder are aerosolized and coated onto the fibers; the coated tow of fibers is then consolidated in a heated press to sinter the mixture of fibers and metal powder (column 4 lines 40-56). The fibers can be made from a PAN-based carbon fiber material (column 5 lines 5-9, column 9 lines 45-48). The metal powder can be aluminum, copper, or magnesium (column 5 lines 10-15). The aerosolizing step constitutes a mixing method in which the direction of the fiber is maintained since the fibers are continuously drawn in a fiber tow. The fiber mixture is implicitly aligned in a two-dimensional manner in the vacuum hot pressing furnace 40 since they are drawn continuously in a fiber tow (figure 1). A cutting step creates a product in which fibers from the fiber tow are continuous from one end to the other in the final composite material; the fibers therefore have a length that is the same as the dimension of the final composite material (column 10 lines 29-31). Subsequent to the cutting step, sintering is performed inside a vacuum hot pressing furnace (column 10 lines 60-63).

Bieler does not appear to explicitly disclose sintering using a pulse electric current. However, Kawai teaches in a method of manufacturing a sintered product: forming a mixture of metal sinterable powders and carbon fibers (column 3 lines 44-47), and sintering the mixture by applying pressure while simultaneously supplying a pulse current through the compacted materials (column 2 lines 32-40, column 2 line 66 to column 3 line 2). Sintering is performed under vacuum (column 5 lines 11-15). It would have been obvious to substitute the pulse electric current sintering method of Kawai

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with the sintering method of Bieler as a conventional alternative or substitute means for affecting sintering in a fiber-reinforced composite structure.

18. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bieler et al. (US 5,891,249) in view of Kawai (US 5,993,733) as applied to claim 11-13, 18, and 20 above, and further in view of Dinwoodie et al. (US 5,002,836). As to claims 15 and 16, modified Bieler teaches maintaining fiber direction while immersing a fiber tow into an aerosolized metal powder suspension as described in the rejection of claim 11 above. Bieler does not appear to explicitly disclose the length of the fibers. However, Dinwoodie teaches in a method for making fiber-reinforced metal matrix composites: using long, continuous fibers that can be several centimeters or several meters long (column 2 lines 25-30). It would have been obvious to substitute the fiber dimensions of Dinwoodie with those of modified Bieler as a conventional fiber length used in fiber-reinforced composite structures.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ATUL KHARE whose telephone number is (571)270-7608. The examiner can normally be reached on Monday-Thursday 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571)272-1176. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ATUL KHARE/  
Examiner, Art Unit 1791

/Matthew J. Daniels/  
Primary Examiner, Art Unit 1791  
3/26/10